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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/932,491	08/17/2001	Cheng Chiang Phua	33726-00020USPT	5213

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EXAMINER

CHU, KIM KWOK

ART UNIT

PAPER NUMBER

2627

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Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/932,491	<b>Applicant(s)</b> PHUA ET AL.	
	<b>Examiner</b> Kim-Kwok CHU	<b>Art Unit</b> 2627	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.  
     4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6,9,14-17,19,20,22,29 and 30 is/are rejected.
- 7) ☒ Claim(s) 2,5,7,8,10-13,18,21 and 23-28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

***Claim Objections***

1. Claims 5, 13, 21 and 28 are objected to because of the following informalities:

(a) in claim 5, line 4, the term " $Z_0$ " should be changed to  $--Z_i --$ ;

(b) similarly, in claim 21, line 3, the term " $Z_0$ " should be changed to  $--Z_i --$ ;

(c) in claim 13, the variables V, C and M should be defined; and

(d) similarly, in claim 28, the variables V, C and M should be defined.

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

*A person shall be entitled to a patent unless--  
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.*

3. Claims 1, 3, 4, 6, 9, 14-17, 19, 20, 22, 29 and 30 are rejected under 35 U.S.C. § 102(b) as being anticipated by Trisnadi (U.S. Patent 5,627,664).

4. Trisnadi teaches a method of modulating data arrays for storage in a multidimensional storage media having all of the steps as recited in claims 1, 3, 4, 6, 9 and 14-16. For example, Trisnadi teaches the following:

(a) With respect to Claim 1, receiving (in a holographic storage medium 32) a 2-dimensional multilevel data array in which each entry in the multilevel (phase encoded) data array has one of a plurality of multilevel (phase) values (Figs. 1A and 3; holographic data recorded as an array are phase encoded); generating a multilevel sequence of random numbers wherein each number in the multilevel sequence of random numbers comprises one of the multilevel values (Fig. 4; data array is encoded by random code); performing at least one of an arithmetic and a logic

operation between elements of the multilevel data array and respective random numbers, from the multilevel sequence of random numbers, in order to produce an intermediate data array providing non-correlation and an even distribution of the multilevel symbols (Fig. 4; page 5, lines 40-65).

(b) With respect to Claim 3, the sequence of random numbers is generated using a formula and a seed (Fig. 4; inherent feature where the sequence of random numbers is generated by a pseudo-random number generator and a seed).

(c) With respect to Claim 4, the sequence is reproduced by using the formula by the presentation of the seed (Fig. 4; inherent feature where the sequence of random numbers is generated by a pseudo-random number generator and a seed).

(d) With respect to Claim 6, the sequence of random numbers is transformed into a multilevel array of random numbers having a same size as the multilevel data array (Fig. 4; random numbers are combined with the orthogonal code).

(e) With respect to Claim 9, the seed is encoded in a multilevel redundant format to minimize data errors, the multilevel redundant format being appended as an additional column or row to the multilevel data array (Figs. 3 and 4; random code adds advantage of increasing number of pages

can be stored at a particular location; column 5, lines 45-49).

(f) With respect to Claim 14, outputting a multilevel output data array, and wherein the method of modulating multilevel data arrays for storage in multidimensional storage media 32 is utilized in a process (by processor 60) for storing at least one page of data in a multidimensional memory 64 (Figs. 1A, 1B and 3; memory 64 is used as a data buffer to store multilevel data arrays before the arrays are stored in the holographic storage medium 32).

(g) With respect to Claim 15, the multilevel output data array is used to control a spatial light modulator 30, 40 for recording the multilevel output data array in a holographic storage media 32 (Figs. 1A and 5).

(h) With respect to Claim 16, reading (signal processing) a page of data from the multidimensional memory 64; and comparing the read page of data with the at least one page of data that was stored in the multidimensional memory 32; if a predetermined difference between the read page and the stored page exists, then repeating storing (data rewriting) the page of data in the multidimensional memory (Fig. 1B; error correction is data rewritten process).

5. Apparatus claims 17, 19, 20, 22 are drawn to the apparatus corresponding to the method of using same as claimed in claims 1, 3, 4, 6 and 9. Therefore apparatus claims 17, 19, 20, 22 correspond to method claims 1, 3, 4, 6 and 9, and are rejected for the same reasons of anticipation as used above. Claim 19 however also recites the following limitation which is also taught in the prior art of Trisnadi:

(a) With respect to Claim 19, generating random numbers with uniform distribution (randomness) over the interval [0,1] (Fig. 4; inherent feature where the sequence of random numbers is generated by a pseudo-random number generator and a seed between 0 and 1 in order to obtain a true randomness).

6. Apparatus claims 29 and 30 are drawn to the apparatus corresponding to the method of using same as claimed in claims 1, 3, 4, 6, and 9. Therefore apparatus claims 29 and 30 correspond to method claims 1, 3, 4, 6 and 9, and are rejected for the same reasons of anticipation as used above. Claim 30 however also recites the following limitation which is also taught in the prior art of Trisnadi:

(a) With respect to Claim 30, a feedback loop, operable during recoding of the multilevel data array into the multidimensional memory, the feedback loop reading out a page of data from the holographic medium 32 after the page has been recorded, then comparing the difference between the read out page and the multilevel data array in order to determine differences between the multilevel data array and the read out page (Fig. 1B; data recording is a feedback process because it inherently includes an error checking/correction step).



**Allowable Subject Matter**

7. Claims 2, 5, 7, 8, 10-13, 18, 21 and 23-28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

As in claims 2 and 18, the prior art of record fails to teach or fairly suggest the following features:

(a) performing a q-ary complementary method to substantially equalize the energy associated with said intermediate data array, said multilevel data array having q levels.

As in claims 5 and 21, the prior art of record fails to teach or fairly suggest the following features:

(a) the sequence of random numbers is generated by using the formula:  $Z_i = (aZ_{i-1}) \pmod{m}$  wherein m (the modulus), a (the multiplier), c (the increment), and  $Z_0$  (the seed) are non-negative integers.

As in claims 7 and 23, the prior art of record fails to teach or fairly suggest the following features:

(a) a modulo-q addition operation is performed between respective elements of said multilevel data array and a q-

level array of random numbers in order to produce an intermediate data array showing non-correlation and an even distribution of said multilevel symbols.

As in claim 28, the prior art of record fails to teach or fairly suggest the following features:

(a) the computing means performs a transfer function according to the equation:

$$V_{out} = |C_{ij} - V_{in} + q M(q, Z_0)|.$$

The features indicated above, in combination with the other elements of the claims, are not anticipated by, nor made obvious over, the prior art of record.

### ***Conclusion***

9 The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ray et al. (6,536,665) is pertinent because Ray teaches a two dimensional encrypted data array.

Kawano et al. (6,512,733) is pertinent because Kawano teaches a holographic storage medium for storing a multilevel data.

Heanue et al. (5,940,514) is pertinent because Heanue teaches an encryption method for a holographic image.

Steenblik et al. (5,715,316) is pertinent because Steenblik teaches a holographic image having an encrypted message.

Redfield (5,377,176) is pertinent because Redfield teaches a holographic storage medium.

10. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kim CHU whose telephone number is (571) 272-7585 between 9:30 am to 6:00 pm, Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch, can be reached on (57) 272-7589.

The fax number for the organization where this application or proceeding is assigned is (571) 273-8300

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished application is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9191 (toll free).

Kim-Kwok CHU

*ka 8/2/06*  
Examiner AU2627  
August 2, 2006

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